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Rubber Research Scheme (Ceylon).

First Quarterly Circular

for

1927.

Reprinted from the *Tropical Agriculturist.*

March, 1927.

H. W. CAVE & CO., PRINTERS.

Notes on Visits to Some Rubber Factories and Research Laboratories in England.

by

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Chemist, Rubber Research Scheme, Ceylon.

Natural Immunity of Rubber Trees to Bark Rot.

by

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Mycologist, Rubber Research Scheme, Ceylon.

Report from the Imperial Institute of samples of Plantation Rubber.

Prepared in Connection with Experiments on Variability arranged by the Ceylon Technical Committee.

Notes on Visits to Some Rubber Factories and Research Laboratories in England.

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Chemist, Rubber Research Scheme, Ceylon.

IT is thought to be of interest to record some impressions of visits to various Rubber factories and Research Institutes which were made by the writer whilst on furlough.

It is most convenient to divide the subject into two sections, visits to factories and visits to Scientific Institutions.

Visits were made to two rubber factories namely, the North British Rubber Company, and the Dunlop Rubber Company, each of which in its own sphere is in the forefront of the Rubber Industry in England.

The North British Rubber Company whose works are situated in Edinburgh specialises in Rubber footwear (of which it is the largest Manufacturer in Great Britain), and in various mechanical goods. The number of different articles manufactured in the works amounts to hundreds.

The manufacture of such diverse articles as shoes, hot water bottles, tyres and vulcanite combs was followed with the greatest interest. To one whose work is connected with the simple processes involved in preparation of raw rubber it was impressive to note the number of processes and the large amount of manipulation required in the production of such an apparently simple article as a Plimsol shoe. The North British Rubber Company have not found that they suffered from competition of the crepe soled shoe. They make a certain number of these shoes, but it was gathered that the demand for them is small compared with their output of vulcanised shoes. They also make a shoe with a vulcanised crepe sole, which has always appeared to the writer to be a more practical proposition than the raw crepe sole.

It was interesting to see the raw rubber as it arrived at the factory. Even at summer temperature the sheet and crepe was comparatively hard, and in winter it is necessary to keep the chests in a warm room to thaw out the rubber before use.

A number of the chests appeared to be in damaged condition and this was not confined to any particular type of chest. It was stated that a damaged ply-wood chest causes more damage from splinters in the rubber than other types. Splinters of wood and other impurities which work their way into the rubber from the chests are a great nuisance to the manufacturer, and for certain purposes it is found necessary to wash, recrepe, and dry the rubber. It was stated that this trouble could be prevented to a large extent if producers adopted the practice of lining chests with sheets of rubber before packing. Contamination would then be confined to the lining sheets which can be stripped off. This practice involves no extra expense to the producer and it is hoped that it will be more generally adopted.

The manufacturer is not particularly interested in the minor defects of raw rubber which cause so much anxiety to the planter, such as slight mould, rust, bubbles, etc. Nor does he care whether sheets are absolutely uniform in size and have nicely trimmed edges and so on. These are merely the criteria of the broker who has no other basis on which to judge the quality of the rubber. Up to a point, insistence on production of rubber of good appearance is probably of value, on the assumption that care with regard to appearance connotes equal care in regard to more important details of manufacture, such as uniformity of method, careful straining of the latex, keeping the rubber free of contamination with copper and from sunlight, etc.

Variability in rate of vulcanisation of different batches of rubber has lost much of its significance since the introduction of organic accelerators, which not only reduce the time of vulcanisation, but tend to equalise the time required by various batches. Furthermore the presence of suitable accelerators produces what is known as a flat cure which means that it is now not so important for the rubber to be vulcanised for exactly the correct length of time.

What is much more troublesome to the manufacturer is variability in plasticity of plantation rubber, *i.e.*, variation in the amount of milling required to bring different batches of rubber to a suitable consistency for manufacturing processes. Both in

factories and in visits to Scientific Institutes this was put forward as the most important problem for producers, viz: to produce rubber having good and uniform plasticising properties.

A number of interesting testing machines of different sorts were seen. Cotton testing is an important item in the rubber factory, and machines for testing tensile strength, and other properties are installed.

The usual method of tyre testing consists of a machine in which the tyre is mounted on a motor wheel which is pressed against the rim of a pulley wheel driven by an electric motor. The load on the tyre is adjusted to that which it would be expected to stand under ordinary conditions and it is rotated at a predetermined speed, normally about 30 miles per hour. In some tests raised cleats of metal are bolted on the rim of the pulley wheel so that the tyre receives several jolts in each revolution. This test does not measure the abrasive resistance of the tread but is essentially a test of the general strength of the tyre. Conditions are varied according to whether it is desired to measure the heat generated in the tyre, the distance run before the tyre bursts or before the tread begins to loosen, the effects of overloading, etc., etc.

What the writer looks on as the last word in refinement was an X-ray apparatus for examining golf balls at the North British Rubber Works. The X-rays show up the hard core and if this is not quite round or centrally placed the ball is rejected as 1st quality. It is comforting to think that an inaccurate putt may be due to a badly balanced ball.

The Dunlop Rubber Company is the largest of its kind in England and the new factories cover a very large area in one of the outskirts of Brimingham. Tyres are the chief product of the factory and most of the writer's visit was devoted to following the stages of manufacture of these indispensable articles. Perhaps the most impressive thing seen was the building up and vulcanising of giant pneumatic tyres which is surely a triumph of tyre manufacture. Side by side with this was the manufacture of cycle, motor cycle, and car inner tubes, which pass through an incredible number of operations before they are finally completed. The first stage consists of forcing or " spewing " the masticated and compounded rubber from a machine through a die in the form of a tube of the required size. It is in watching such a machine that one realises the prime importance of uniformity of plasti-

city. If the rubber has been insufficiently plasticised, instead of coming from the spewing machine as a smooth uniform tube it comes through rough and uneven and has to be sent back to be reworked. Solid tyre treads for lorries are spewed in the same way.

As would be expected in a works of the size and character of Fort Dunlop, tyre testing is a most important subject and a large building is devoted to the purpose. In general the testing machines are similar to the one previously described, with variations for different purposes. The chief impression one receives of the testing building is that it is an inferno of noise in which one has to shout to make oneself heard.

There is a separate substantial building containing a machine for testing racing tyres and this is run at a speed of over 100 miles per hour. It can be imagined that when a tyre tread leaves the wheel at this speed it flies off with considerable momentum, and the observer is in the separate room watching through a slit in the wall. It was noted in a motoring paper recently that the Dunlop Company are designing a tyre for a racing enthusiast who wishes to achieve 200 miles per hour, so presumably the testing machine has been speeded up since the writer's visit.

In addition to bench tests a number of lorries and cars are maintained for road tests and some of these cover phenomenal distances in a year.

To turn to the other side of the subject, visits were made to the laboratories of the Research Association of British Rubber and Tyre Manufacturers at Croydon, the Nederlands Government Rubber Institute in Holland, and of course our own London laboratories at the Imperial Institute.

It is unnecessary to deal here in any detail with the interesting Research work which was in progress. The Croydon Institution deals with problems concerning the manufacture and the subjects under investigation included experiments on the ageing of rubber, comparisons of tyres for Government Departments, experiments on fatigue of rubber, resiliency, resistance to abrasion, and so on. One of the features of this laboratory is the excellent library which is available to members of the association.

Dr. Van Rossem, the Director of the Nederlands Rubber Institute, formerly did a great deal of work on preserved latex both from the practical and chemical point of view. At present the most interesting investigation in progress is concerned with

the tensile properties of rubber at high temperatures. The Nederland's Rubber Growers' Propaganda Department maintains a Chemist at the same laboratories and he was engaged on investigation of the adhesion of rubber paving. This is a more difficult problem than might be thought.

At the Imperial Institute work chiefly centres round the subjects of variability of plasticity of rubber, and improvement in the ageing properties of vulcanised rubber. Our chemists in London have designed a machine for testing plasticity of rubber which is much more sensitive than the type which was previously used.

That summarises the impressions of what was seen in connection with rubber in England. The point which it is particularly desired to stress is that both in factories and in Research Institutions it was impressed on the writer that the chief defect of plantation rubber at the present time is variability of plasticity. The manufacturer wants a plastic, easily workable rubber, but above all he wants a uniformly plastic rubber. As mentioned earlier, observation of the manufacture of solid tyres and inner tubes demonstrates the inconvenience and loss that may be caused by variability of plasticity.

The causes of variability of plasticity and methods for its correction will have to be investigated scientifically, by the producer of rubber, the planter can do considerably more towards the production of uniform rubber than is done at present. I refer to uniformity in method of preparation, and bulking together of large quantities of latex before coagulation.

It is likely that rubber from different fields and trees of different ages will differ in plasticity and it follows that if the latex from a 1,000 acre estate is coagulated in 15 Shanghai jars there is the likelihood that each batch will have a different plasticity. The writer would like to see Shanghai jars done away with and replaced by tanks of such size that the day's crop can be received and coagulated in one or two tanks. A small tank would be provided for latex which arrives at the factory late. This would ensure that at least each day's crop was uniform in properties, and would bring Ceylon into line with the other rubber producing countries.

In addition, bulking of latex in large tanks makes it easier to control dilution of the latex to standard rubber content, and the use of correct quantities of acid and bisulphite. Coagulation at

standard rubber content, for which 2 lb. per gallon for crepe and 1½ lb. for sheet is recommended, will play its part in making the crop more uniform from day to day. In the case of sheet manufacture it is necessary to run the bulked latex off into smaller receptacles before addition of acid if the present system of pen coagulation is retained.

Before leaving the subject of variability of plasticity, mention should be made of " sprayed " rubber. This type of rubber is prepared by spraying latex into a heated chamber whereby moisture is removed and the rubber falls to the ground in the form of a snow which is then ready for packing. It is claimed by the inventors that rubber prepared in this way is superior to other forms of rubber in tensile strength, ageing properties, plasticity and uniformity of plasticity. English investigators for the most part are agreed that as far as laboratory experiments go these claims can be substantiated. Up to the present the rubber has not been tested to any great extent by British manufacturers but if they agreed that it was a suitable type of rubber for their purposes, it seems possible that solution of the problem of variability of plasticity might be achieved by adoption of this method of preparation.

The manufacturer also wants rubber that is free from dirt and grit and in this respect special care is required in Ceylon. Personally the writer would like to see the *sheratty* abolished and replaced by cups that are taken in to the factory each day and washed; but as this is most improbable, great care should be taken that *sheratties* are not left lying on the ground. Apart from any other consideration it would probably pay the planter to see that *sheratties* are hung up on the trees on sticks, in that his cup scrap rubber would be of better colour and quality if it had not been exposed to the sun for 2 days.

Finally, to refer again to packing of rubber: it costs the producer nothing to line his chests with sheets or crepe before packing, and it is stated by the Chief Chemist of the Dunlop Company that this is a great protection in preventing splinters of wood from working in between the sheets in the chest.

Natural Immunity of Rubber Trees to Bark Rot.

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IN the course of some experiments carried out on the control of Bark Rot by disinfectants applied to the tapping-cut, observations of the same trees on two successive years gave reason to believe that on the whole the same trees which were infected by Bark Rot one year tended to be re-infected the next year, while those not attacked remained free the following season. It was apparent that this was not strictly the case, but there appeared to be more trees attacked both years than would be expected on a chance or random distribution of infection.

A careful analysis of the actual numbers of cases bears out this conclusion and it is intended in this article to give a summary of the analytical results obtained.

A detailed description of the experiments is not necessary, and has been given elsewhere, but an outline of the design is essential for an undertaking of the tables which follow.

A plot of 1,440 trees was divided up into four blocks of eighteen rows, each row containing twenty trees. To the trees in each of the rows in the first block was applied a different disinfectant, and these treatments were repeated in the remaining three blocks, so that in all eighty trees were treated with each of eighteen disinfectants (more precisely seventeen, as one row in each block was left untreated to serve as a control). The experiment was carried out during the S. W. Monsoon period of 1925 and repeated in the same season of 1926. All trees were tapped on a $\frac{1}{2}$-cut every third day during 1925 and on alternate days in 1926. The practice on the estate is to change-over the

cuts to the opposite sides of the trees twice a year, so that the same panel was in tapping in both experiments, except in those cases where a new cut had to be opened in 1926.

Examinations of every tree for Bark Rot were made twice in the 1925 experiment (July and August) and once in 1926 (August). In the examinations all trees which showed more than one or two black lines along the tapping-cut were considered as diseased.

In the analysis of the figures which follows all trees which were out of tapping in either year for any cause other than Bark Rot are left out of the count, so that in each block there is a total of less than 80.

Now, assuming that all trees were equally susceptible to Bark Rot it would be expected that on the whole the distribution of infection in 1926 would be proportional to the infection in 1925. For example, suppose in any one block of four rows treated alike, there was 75 per cent. of infection; that is to say 60 trees infected and 20 uninfected out of the total of 80 (assuming all to be in tapping). Then suppose that in 1925 there were 40 trees attacked by Bark Rot (50 per cent. infection). Then if the chances of infection are equal it would be expected that of these 40, 75 per cent. would be trees that had been attacked in 1925 and 25 per cent. of " new cases." That is 30 of the 1926 cases should be on trees attacked in 1925 also, and 10 should be on trees free from Bark Rot in 1925. This exact distribution would never, of course, be found. but it is possible by statistical methods to show what deviation from the expected results may be regarded as significant.

For the purposes of the analysis it is necessary to know the total number of cases in 1925, the percentage infection that this represents, in the same figures for 1926, and the number of cases occurring on the same trees in both years. From the first four may be calculated the expected distribution, and this may be compared with the last, the observed distribution. The actual results

are as follows:—

Row	Total cases 1925	Total un-attacked 1925.	Percen-tage of Bark Rot	Total cases 1926.	Total un-attacked 1926.	*A.*	*B.*	*C.*
A.	47	21	69	27	41	19	23	+4
B.	45	25	64·5	25	45	16	18	+2
C.	46	26	64	24	48	15	16	+1
D.	51	17	75	32	36	24	27	+3
E.	44	28	61	32	40	20	21	+1
F.	56	13	81	41	28	33	35	+2
G.	49	23	68	28	44	19	21	+2
H.	42	29	59	32	39	19	21	+2
J.	55	17	76·5	23	49	18	19	+1
K.	48	19	72	30	37	21	25	+4
L.	50	21	70·5	24	47	17	21	+4
M.	51	21	71	25	47	18	19	+1
N.	42	23	64·5	33	32	20	26	+6
O.	53	23	70	27	49	19	22	+3
P.	45	23	66	23	45	15	20	+5
R.	38	28	57·5	24	42	14	17	+3
S.	41	25	62	19	47	12	14	+2
T.	56	16	74·5	30	42	23	27	+4
Total.	859	398	68	499	758	342	392	+50

Column A shows the number of trees expected to be infected both years assuming a chance distribution of infection. Column B gives the number of such cases actually found. Column C gives the difference between the expected and the observed results.

It will be seen that a total of 50 more trees were attacked in both years than would be expected if all trees were equally susceptible. Similarly, of course, there were 50 fewer "new cases" than would be expected. The important point to note, however, is that in *each* of the eighteen sets an excess is found for the observed over the expected. Now if the chances of attack of all trees were equal positive and negative signs should occur in the last column with equal frequency. It may be shown from what is known as the " binominal distribution " that all will be of the same sign, by chance, only twice in 262,144 trials. There is, therefore, no doubt whatever that the observed distribution is very significantly different from the expected.

The cause of this discrepancy must obviously lie in the fact that certain trees are more or less immune to Bark Rot, or at least they show greater resistance to the disease.

At first sight it may be objected that the results are upset by the difference in treatment of the trees, but it will be seen that this really has no effect upon the results, for the different treatments are each considered separately and have no bearing upon each other, and the ratios are left unaffected.

Report from the Imperial Institute on Samples of Plantation Rubber.

Prepared in Connection with Experiments on Variability arranged by the Ceylon Technical Committee.

THE samples which are the subject of this report were prepared in Ceylon by the instructions of the Ceylon Technical Committee for the purpose of comparing the variability in time of vulcanisation of samples prepared (1) by the method employed on an Estate and (2) by the standard method recommended by the Rubber Growers' Association. A further set of samples, prepared by the Rubber Growers' Association method from latex from larger groups of trees on successive days, was also sent in order that the extent of the variation from day to day might be investigated.

The estate is divided into two divisions and the day's yield of latex was poured into 10 Shanghai jars, the latex from one division being poured into jars 1-5, and that from the other division into jars 6-10, in accordance with the usual practice on the estate. No attempt was made to bulk the latex or to separate it into fields, each jar being filled in turn.

The latex in each jar was divided into three portions: (a) one portion (Nos. 1168-1177) was converted into crepe according to the usual factory procedure which was described as follows:—

> " Latex diluted to approximately 25 per cent. (judged by the consistency of the latex). 8 oz. of Sodium Bisulphite added to 50 gallons of latex, *i.e.*, in the proportion of 1 lb. to 250 lb. dry rubber if the dilution of the latex was correct. Coagulated by addition of 5 oz. Acetic Acid (suitably diluted), *i.e.*, in the proportion of 1 lb. to 400 lb. dry rubber if the dilution of the latex was correct."

(b) a second portion (Nos. 1178-1187) was converted into crepe by the method recommended by the Rubber Growers' Association, which was described as follows:—

> " Latex diluted to 20 per cent. rubber content. Sodium Bisulphite added in the proportion of 1 lb. to 200 lb. dry rubber. Acetic Acid added in the proportion of 1 lb. to 200 lb. dry rubber."

(c) The third portion from each jar was mixed and the bulked latex was then converted into crepe: No. 1188 by the Rubber Growers' Association method and No. 1189 by the method employed in previous experiments carried out by the Ceylon Rubber Research Scheme, which differs only slightly from the method recommended by the Rubber Growers' Association.

In addition, a sample of crepe was prepared by the Rubber Growers' Association method from bulked latex from the 10 Shanghai jars on each of the following nine days (Nos. 1190-1198). As the estate was on a three-day tapping system only the samples prepared every third day were obtained from latex from the same trees.

The samples were tested for variability (1) in time of vulcanisation in a rubber-sulphur mixing (90:10) and (2) for variability in tensile strength and elongation when vulcanised in an accelerator-zinc-oxide mixing.

In the case of the rubber-sulphur mixing the samples were vulcanised for a period of 120 minutes and from the results of Schopper machine tests the time of vulcanisation required to give an elongation of 775 per cent. under a load of 1·04 kgs./sq.mm. was calculated.

The accelerator-zinc-oxide mixing employed was 90 rubber, 5 sulphur, 5 zinc oxide, 1 diphenyl guanidine. Samples were tested after vulcanisation for 25 minutes at 148° C.

1. Comparison of Rubber Growers' Association method and Estate method.

(a) *Rubber Sulphur mixing.*

The following are the results obtained:—

Nos. 1168-1189—All prepared on same day.

Sample No.	Jar No.	Method of preparation	Tensile Strength	Elongation at load of 1·04 kgs./sq. mm.	Calculated time of vulcanisation
			(lb. /sq. in.)	(per cent.)	(mins.)
1168	1 (1st Divn.)	Estate Method	1940	882	144
1169	2 ,, ,,	,, ,,	1790	904	149
1170	3 ,, ,,	,, ,,	1900	907	149
1171	4 ,, ,,	,, ,,	1930	882	144
1172	5 ,, ,,	,, ,,	1990	889	145
1173	6 (2nd Divn.)	,, ,,	1910	895	147
1174	7 ,, ,,	,, ,,	1840	890	146
1175	8 ,, ,,	,, ,,	1840	895	147
1176	9 ,, ,,	,, ,,	1870	886	145
1177	10 ,, ,,	,, ,,	1850	890	146
1178	1 (1st Divn.)	R. G. A. Method	1710	899	147
1179	2 ,, ,,	,, ,,	1700	909	150
1180	3 ,, ,,	,, ,,	1760	900	148
1181	4 ,, ,,	,, ,,	1850	890	146
1182	5 ,, ,,	,, ,,	1830	889	145
1183	6 (2nd Divn)	,, ,,	1900	866	140
1184	7 ,, ,,	,, ,,	1880	870	141
1185	8 ,, ,,	,, ,,	1880	863	140
1186	9 ,, ,,	,, ,,	1880	886	145
1187	10 ,, ,,	,, ,,	1740	880	143

The samples prepared by the estate method from latex from the separate jars 1-5, *i.e.*, from latex obtained from the First Division, vary in time of vulcanisation from 144 to 149 minutes; samples prepared by the Rubber Growers' Association method from the same latex vary from 145 to 150 minutes.

The samples prepared by the estate method from latex from the separate jars 6 to 10, *i.e.*, from latex obtained from the Second Division, vary in time of vulcanisation from 145 to 147

minutes; those prepared by the Rubber Growers' Association method from the same latex vary from 140 to 145 minutes.

The results show therefore that there is no appreciable difference in the times of cure of the samples prepared by the method customarily used on the estate and those of samples prepared according to the method recommended by the Rubber Growers' Association.

(b) *Accelerator-zinc-oxide mixing.*

The following are the results obtained in this mixing.

Sample No,	Jar No.	Method of preparation	Tensile Strength	Elongation at load of 1·04 kgs./sq. mm
			(lbs./sq in.)	(per cent.)
1168	1 (1st Divn.)	Estate Method	2750	597
1169	2 ,, ,,	,, ,,	2950	594
1170	3 ,, ,,	,, ,,	2900	596
1171	4 ,, ,,	,, ,,	2860	594
1172	5 ,, ,,	,, ,,	3080	592
1173	6 (2nd Divn.)	,, ,,	3050	582
1174	7 ,, ,,	,, ,,	2850	592
1175	8 ,, ,,	,, ,,	2910	592
1176	9 ,, ,,	,, ,,	2900	595
1177	10 ,, ,,	,, ,,	2940	592
1178	1 (1st Divn.)	R. G. A. Method	2760	603
1179	2 ,, ,,	,, ,,	3020	603
1180	3 ,, ,,	,, ,,	2960	599
1181	4 ,, ,,	,, ,,	2780	602
1182	5 ,, ,,	,, ,,	3000	595
1183	6 (2nd Divn.)	,, ,,	2900	599
1184	7 ,, ,,	,, ,,	2960	605
1185	8 ,, ,,	,, ,,	2960	606
1186	9 ,, ,,	,, ,,	2770	606
1187	10 ,, ,,	,, ,,	2820	602

The results are extremely uniform, no important difference occurring in either tensile strength or elongation. It is of interest that the latex from jar 5 yielded the strongest rubber when the estate method of preparation was employed and the next to the strongest with the Rubber Growers' Association method: the latex from jar 1 yielded the weakest sample in both cases.

The elongations of the samples prepared by the Rubber Growers' Association method are slightly greater than those of the samples prepared by the estate method. On the other hand, the tensile strengths of the samples prepared by the estate method are in some cases a little higher.

2. Variability of Rubber prepared by the Rubber Growers' Association Method on Successive days.

(a) *Rubber Sulphur mixing.*

The following are the results obtained:—

Sample No.	Jar No.	Method of preparation.	Tensile Strength.	Elongation at load of 1·04/ kgs. sq. mm.	Calculated time of valcanisation
			(lb. /sq. in.	(per cent.)	(mins.)
1188	Bulked Latex 1-10	R. G. A. Method	1840	875	142
1189	Bulked Latex 1-10	Method employed in previous Ceylon Rubber Research Scheme experiments	1730	890	146
1190)		R. G. A. Method	1900	862	139
1191)		,, ,,	1930	897	147
1192)	Bulked Latex	,, ,,	2030	838	134
1193)	1-10-Prepared	,, ,,	1900	871	141
1194)	on the following	,, ,,	2070	855	138
1195)	nine days	,, ,,	1900	873	142
1196)		,, ,,	1620	904	149
1197)		,, ,,	1820	875	142
1198)		,, ,,	1850	882	144

The results do not vary greatly, although they are not so uniform as those given by the previous set of samples dealt with in this report.

As the estate was on a three-day tapping system only the samples prepared every third-day were from the same groups of trees. There are accordingly three samples from two groups of trees and four from a third. In the case of the two groups of

trees from each of which three samples were obtained, the variation in time of cure is from 138 to 147 minutes and from 139 to 149 minutes respectively. In the case of the third group of trees, represented by four samples, the range of cure is from 134 to 144 minutes.

(b) *Accelerator-zinc-oxide mixing.*

The following are the results obtained in this mixing:—

Sample No.	Jar No.	Method of preparation.	Tensile Strength.	Elongation at load of 1·04 kgs. /sq. mm.
			(lb. /sq. in).	(per cent.)
1188	1—10	R. G. A. Method	2910	698
1189		,, ,,	2720	604
1190		,, ,,	3060	591
1191		,, ,,	2880	616
1192		,, ,,	2850	609
1193		,, ,,	3220	600
1194		,, ,,	3070	591
1195		,, ,,	2780	619
1196		,, ,,	2900	610
1197		,, ,,	2840	613
1198		,, ,,	2950	602

There is very little variation in these results. The differences are chiefly in tensile strength and it is of interest to observe that samples from one group of trees, viz: Nos. 1190, 1193 and 1196 are inclined to be stronger than those from the other two.

NOTICES.

Arrangements have now been made for Bulletins of the Ceylon Rubber Research Scheme to be made available to non-contributors to the Scheme at the rate of Rs. 15-00 per annum, post free.

PACKING OF RUBBER.

Information has been received by the Association that complaints have been made in regard to Ceylon Banket Crepe, it being stated that splinters are found in the interior layers of the crepe.—Bulletin of the Rubber Growers' Association. Vol. 8, No. 12.

OFF-COLOURED CREPE.

The Chemist to the Rubber Research Scheme would be glad to get into touch with the Superintendent of any estate who is troubled with off-colour crepe, and who thinks that this may be due to impurities in the water used for manufacture.

The attention of contributors to the Rubber Research Scheme is drawn to the following small book on bud-grafting which is essentially practical and useful :—Practical Bud-Grafting and Seed Selection of Hevea Brasiliensis by H. Gough.

Obtainable from :—

Messrs. KELLY & WALSH, Ltd.,
Raffles Squares, Singapore.